



SEQUENCE LISTING

<110> Barany, Francis  
Cao, Weiguo  
Tong, Jie

<120> HIGH FIDELITY THERMOSTABLE LIGASE AND USES THEREOF

<130> 19603/2615

<140> 09/830,502

<141> 1999-10-29

<150> 60/106,461

<151> 1998-10-30

<150> PCT/US99/25437

<151> 1999-10-29

<160> 31

<170> PatentIn Ver. 2.1

<210> 1

<211> 674

<212> PRT

<213> Thermus sp.

<400> 1

Met Thr Leu Glu Glu Ala Arg Arg Arg Val Asn Glu Leu Arg Asp Leu  
1 5 10 15

Ile Arg Tyr His Asn Tyr Leu Tyr Tyr Val Leu Asp Ala Pro Glu Ile  
20 25 30

Ser Asp Ala Glu Tyr Asp Arg Leu Leu Arg Glu Leu Lys Glu Leu Glu  
35 40 45

Glu Arg Phe Pro Glu Leu Lys Ser Pro Asp Ser Pro Thr Glu Gln Val  
50 55 60

Gly Ala Arg Pro Leu Glu Ala Thr Phe Arg Pro Val Arg His Pro Thr  
65 70 75 80

Arg Met Tyr Ser Leu Asp Asn Ala Phe Ser Leu Asp Glu Val Arg Ala  
85 90 95

Phe Glu Glu Arg Ile Glu Arg Ala Leu Gly Arg Lys Gly Pro Phe Leu

100	105	110
Tyr Thr Val Glu Arg Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr		
115	120	125
Glu Glu Gly Ile Leu Val Phe Gly Ala Thr Arg Gly Asp Gly Glu Thr		
130	135	140
Gly Glu Glu Val Thr Gln Asn Leu Leu Thr Ile Pro Thr Ile Pro Arg		
145	150	155
Arg Leu Thr Gly Val Pro Asp Arg Leu Glu Val Arg Gly Glu Val Tyr		
165	170	175
Met Pro Ile Glu Ala Phe Leu Arg Leu Asn Gln Glu Leu Glu Glu Ala		
180	185	190
Gly Glu Arg Ile Phe Lys Asn Pro Arg Asn Ala Ala Ala Gly Ser Leu		
195	200	205
Arg Gln Lys Asp Pro Arg Val Thr Ala Arg Arg Gly Leu Arg Ala Thr		
210	215	220
Phe Tyr Ala Leu Gly Leu Gly Leu Glu Glu Thr Gly Leu Lys Ser Gln		
225	230	235
His Asp Leu Leu Leu Trp Leu Arg Glu Arg Gly Phe Pro Val Glu His		
245	250	255
Gly Phe Thr Arg Ala Leu Gly Ala Glu Gly Val Glu Glu Val Tyr Gln		
260	265	270
Ala Trp Leu Lys Glu Arg Arg Lys Leu Pro Phe Glu Ala Asp Gly Val		
275	280	285
Val Val Lys Leu Asp Asp Leu Ala Leu Trp Arg Glu Leu Gly Tyr Thr		
290	295	300
Ala Arg Thr Pro Arg Phe Ala Leu Ala Tyr Lys Phe Pro Ala Glu Glu		
305	310	315
Lys Glu Thr Arg Leu Leu Ser Val Ala Phe Gln Val Gly Arg Thr Gly		
325	330	335
Arg Ile Thr Pro Val Gly Val Leu Glu Pro Val Phe Ile Glu Gly Ser		
340	345	350
Glu Val Ser Arg Val Thr Leu His Asn Glu Ser Phe Ile Glu Glu Leu		

355	360	365
Asp Val Arg Ile Gly Asp Trp Val Leu Val His Lys Ala Gly Gly Val		
370	375	380
Ile Pro Glu Val Leu Arg Val Leu Lys Glu Arg Arg Thr Gly Glu Glu		
385	390	395
Lys Pro Ile Ile Trp Pro Glu Asn Cys Pro Glu Cys Gly His Ala Leu		
	405	410
		415
Ile Lys Glu Gly Lys Val His Arg Cys Pro Asn Pro Leu Cys Pro Ala		
	420	425
		430
Lys Arg Phe Glu Ala Ile Arg His Tyr Ala Ser Arg Lys Ala Met Asp		
	435	440
		445
Ile Gln Gly Leu Gly Glu Lys Leu Ile Glu Lys Leu Leu Glu Lys Gly		
	450	455
		460
Leu Val Arg Asp Val Ala Asp Leu Tyr Arg Leu Lys Lys Glu Asp Leu		
	465	470
		475
Val Asn Leu Glu Arg Met Gly Glu Lys Ser Ala Glu Asn Leu Leu Arg		
	485	490
		495
Gln Ile Glu Glu Ser Lys Gly Arg Gly Leu Glu Arg Leu Leu Tyr Ala		
	500	505
		510
Leu Gly Leu Pro Gly Val Gly Glu Val Leu Ala Arg Asn Leu Ala Leu		
	515	520
		525
Arg Phe Gly His Met Asp Arg Leu Leu Glu Ala Gly Leu Glu Asp Leu		
	530	535
		540
Leu Glu Val Glu Gly Val Gly Glu Leu Thr Ala Arg Ala Ile Leu Asn		
	545	550
		555
Thr Leu Lys Asp Pro Glu Phe Arg Asp Leu Val Arg Arg Leu Lys Glu		
	565	570
		575
Ala Gly Val Glu Met Glu Ala Lys Glu Arg Glu Gly Glu Ala Leu Lys		
	580	585
		590
Gly Leu Thr Phe Val Ile Thr Gly Glu Leu Ser Arg Pro Arg Glu Glu		
	595	600
		605
Val Lys Ala Leu Leu Arg Arg Leu Gly Ala Lys Val Thr Asp Ser Val		

610

615

620

Ser Arg Lys Thr Ser Phe Leu Val Val Gly Glu Asn Pro Gly Ser Lys  
 625 630 635 640

Leu Glu Lys Ala Arg Ala Leu Gly Val Pro Thr Leu Ser Glu Glu Glu  
 645 650 655

Leu Tyr Arg Leu Ile Glu Glu Arg Thr Gly Lys Asp Pro Arg Ala Leu  
 660 665 670

Thr Ala

<210> 2

<211> 2025

<212> DNA

<213> *Thermus* sp.

<400> 2

atgaccctag aggaggcccc caggcgcgctc aacgaactca gggacctgat ccgttaccac 60  
 aactacctct attacgtctt ggacgcccc gagatctccg acgccgagta cgaccggctc 120  
 cttagggagc ttaaggagct ggaggagcgc tttcccgagc tcaaaagccc cgactcccc 180  
 acggaacagg tgggggagcgc gcctctggag gccaccttc gcccggtgcg ccacccacc 240  
 cgcattgtact ccctggacaa cgccttttcc ttggacgagg tgagggcctt tgaggagcgc 300  
 atagagcggg ccctggggcg gaaggggccc ttctcttaca ccgtggagcg caaggtggac 360  
 ggtctttccg tgaacctcta ctacgaggag ggcattctcg tctttggggc caccggggc 420  
 gacggggaga ccggggagga ggtgaccag aacctctca ccatccccc cattccccgc 480  
 cgctcacgg gcgttcgga ccgctcgag gtccggggcg aggtctacat gccatagag 540  
 gccttctca ggctcaacca ggagctggag gaggcgggg agcgcatctt caaaaacccc 600  
 aggaacgccg ccgcccgggc cttgcggcag aaagacccca gggtcacggc caggcggggc 660  
 ctgagggcca ccttttacgc cctggggctg ggcctggagg aaaccgggtt aaaaagccag 720  
 cagcaccttc tcctatggct aagagagcgg ggctttcccg tggagcacgg ctttaccgg 780  
 gccctggggg cggagggggt ggaggaggtc taccaggcct ggctcaagga gaggcggaag 840  
 cttccctttg aggccgacgg ggtggtggtc aagctggacg acctcgccct ctggcgggag 900  
 ctgggggtaca ccgcccgcac cccccgttc gccctcgctt acaagttccc ggccgaggag 960  
 aaggagaccc gcctcctctc cgtggccttc cagggtggggc ggaccgggag catcaccccc 1020  
 gtgggcggtt tggagcccgt cttcatagag ggcagcgagg tgagccgggt caccctccac 1080  
 aacgagagct tcattgagga gctggacgtg cgcattcgcg actgggtgct ggtccacaag 1140  
 gcgggagggg tgattcccgga ggtgctgagg gtctgaaag agcgccgcac cggggaggag 1200  
 aagcccatca tctggcccga gaactgcccc gagtgcggcc acgcccctcat caaggagggg 1260  
 aaggtccacc gctgccccaa ccccttgtgc cccgccaagc gctttgaggc catccgccac 1320  
 tacgcctccc gcaaggccat ggacatccag ggctggggg agaagctcat agaaaagctt 1380  
 ctggaaaagg gcctggtccg ggacgtggcc gacctctacc gcctgaagaa ggaggacctg 1440  
 gtgaacctgg agcgcatggg ggagaagagc gcagagaacc tcctccgcca gatagaggag 1500  
 agcaagggcc gcggcctgga gcgcctcctt tacgcctgg gccttcccgg ggtgggggag 1560  
 gtgctggccc ggaacctggc cctccgcttc ggccacatgg accgccttct ggaggcgggc 1620

ctcgaggacc tcctggaggt ggaggggggtg ggcgagctca ccgcccgggc catcctgaat 1680  
accctaaagg acccgaggtt ccgggacctg gtgcgccgcc tgaaggaggc cgggggtggag 1740  
atggaggcca aagagcggga gggcgaggcc ttgaaggggc tcaccttcgt catcaccggg 1800  
gagctttccc ggccccggga ggaggtgaag gccctcctta ggcggcttgg ggccaagggtg 1860  
acggactcgg tgagccgcaa gacgagcttc ctggtggtgg gggagaaccc ggggagcaag 1920  
ctggaaaagg cccgcgcctt ggggggtcccc accctgagcg aggaggagct ctaccgcctc 1980  
attgaggaga ggacgggcaa ggaccaagg gccctcacgg cctag 2025

<210> 3  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: probe or primer

<220>  
<221> tRNA  
<222> (4)  
<223> w at position 4 can be T or A

<220>  
<221> unsure  
<222> (5)  
<223> s at position 5 can be C or G

<220>  
<221> unsure  
<222> (12)  
<223> s at position 12 can be C or G

<220>  
<221> unsure  
<222> (15)  
<223> r at position 15 can be G or A

<220>  
<221> unsure  
<222> (18)  
<223> y at position 18 can be T or C

<400> 3  
atcwscgacg csgartayga

20

<210> 4

<211> 7  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: protein

<400> 4  
Ile Ser Asp Ala Glu Tyr Asp  
1 5

<210> 5  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: probe or  
primer

<220>  
<221> unsure  
<222> (3)  
<223> s at position 3 can be C or G

<220>  
<221> unsure  
<222> (6)  
<223> s at position 6 can be C or G

<220>  
<221> unsure  
<222> (8)  
<223> k at position 8 can be G or T

<220>  
<221> unsure  
<222> (9)  
<223> s at position 9 can be G or C

<220>  
<221> unsure  
<222> (12)  
<223> s at position 12 can be G or C

<220>  
<221> unsure

<222> (15)  
<223> y at position 15 can be C or T

<220>  
<221> unsure  
<222> (18)  
<223> r at position 18 can be A or G

<400> 5  
ccsgtscksc csacytgraa

20

<210> 6  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: probe or  
primer

<220>  
<221> unsure  
<222> (9)  
<223> v at position 9 can be C, G, or A

<220>  
<221> unsure  
<222> (11)  
<223> r at position 11 can be A or G

<220>  
<221> unsure  
<222> (12)  
<223> y at position 12 can be T or C

<220>  
<221> unsure  
<222> (16)  
<223> s at position 16 is C or G

<220>  
<221> unsure  
<222> (17)  
<223> w at position 17 can be A or T

<220>  
<221> unsure

<222> (18)

<223> s at position 18 can be G or C

<400> 6

gcctttctcva ryttgswscc

20

<210> 7

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: probe or  
primer

<400> 7

Phe Gln Val Gly Arg Thr Gly

1

5

<210> 8

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: probe or  
primer

<400> 8

Gly Ser Lys Leu Glu Lys Ala

1

5

<210> 9

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: probe or  
primer

<400> 9

gcgatttcat atgaccctag aggaggcccg

30



<210> 10  
<211> 29  
<212> DNA  
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: probe or  
primer

<400> 10  
gcgggatccg aggccttgga gaagctctt

29

<210> 11  
<211> 33  
<212> DNA  
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: probe or  
primer

<400> 11  
aaaaccctgt tccagcgtct gcggtgttgc gtc

33

<210> 12  
<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: probe or  
primer

<400> 12  
agttgtcata gtttgatcct ctagtctggg

30

<210> 13  
<211> 29  
<212> DNA  
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: probe or  
primer

<400> 13  
ccctgttcca gcgtctgcgg tggtgcgtt

29

<210> 14  
<211> 59  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: probe or  
primer

<400> 14  
gggacaaggt cgcagacgcc acaacgcagt caacagtatc aaactaggag atcagaccc 59

<210> 15  
<211> 184  
<212> PRT  
<213> Thermus aquaticus

<220>  
<221> UNSURE  
<222> (18)..(120)  
<223> Xaa at positions 18-120 is any amino acid

<220>  
<221> UNSURE  
<222> (126)..(172)  
<223> Xaa at positions 126-172 is any amino acid

<400> 15  
Tyr Thr Val Glu His Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr  
1 5 10 15

Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
50 55 60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
65 70 75 80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
85 90 95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
100 105 110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Glu Glu Thr Gly Xaa Xaa Xaa  
115 120 125

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
130 135 140

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
145 150 155 160

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Phe Glu Ala  
165 170 175

Asp Gly Val Val Val Lys Leu Asp  
180

<210> 16  
<211> 187  
<212> PRT  
<213> Thermus flavus

<220>  
<221> UNSURE  
<222> (18)..(120)  
<223> Xaa at positions 18-120 is any amino acid

<220>  
<221> UNSURE  
<222> (129)..(175)  
<223> Xaa at positions 129-175 is any amino acid

<400> 16  
Tyr Thr Val Glu His Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr  
1 5 10 15

Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

50	55	60
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa		
65	70	75 80
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa		
	85	90 95
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa		
100	105	110
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa		
115	120	125
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa		
130	135	140
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa		
145	150	155 160
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa		
165	170	175
Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa		
180	185	

<210> 17  
 <211> 184  
 <212> PRT  
 <213> Thermus filiformis

<220>  
 <221> UNSURE  
 <222> (18)..(120)  
 <223> Xaa at positions 18-120 is any amino acid

<220>  
 <221> UNSURE  
 <222> (126)..(172)  
 <223> Xaa at positions 126-172 is any amino acid

<400> 17  
 Tyr Thr Val Glu His Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr  
 1 5 10 15

Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 50 55 60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 65 70 75 80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 85 90 95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 100 105 110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 115 120 125

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 130 135 140

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 145 150 155 160

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 165 170 175

Asp Gly Val Val Val Lys Met Asp  
 180

<210> 18  
 <211> 184  
 <212> PRT  
 <213> *Thermus filiformis*

<220>  
 <221> UNSURE  
 <222> (18)..(120)  
 <223> Xaa at positions 18-120 is any amino acid

<220>  
 <221> UNSURE  
 <222> (126)..(172)  
 <223> Xaa at positions 126-172 is any amino acid

<400> 18

Tyr	Thr	Val	Glu	His	Lys	Val	Asp	Gly	Leu	Ser	Val	Asn	Leu	Tyr	Tyr
1				5					10					15	
Glu	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
			20					25					30		
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
			35				40					45			
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
			50				55				60				
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
65						70				75					80
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
					85				90					95	
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
					100				105					110	
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Leu	Glu	Glu	Ser	Gly	Xaa	Xaa	Xaa
					115				120			125			
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
					130				135			140			
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
145						150				155					160
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Pro	Phe	Glu	Ala
					165				170					175	
Asp	Gly	Val	Val	Val	Lys	Leu	Asp								
						180									

<210> 19

<211> 184

<212> PRT

<213> Thermus sp.

<220>

<221> UNSURE

<222> (18)..(120)

<223> Xaa at positions 18-120 is any amino acid

<220>

<221> UNSURE

<222> (126)..(172)

<223> Xaa at positions 126-172 is any amino acid

<400> 19

Tyr Thr Val Glu His Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr  
1 5 10 15

Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
50 55 60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
65 70 75 80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
85 90 95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
100 105 110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
115 120 125

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
130 135 140

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
145 150 155 160

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Phe Glu Ala  
165 170 175

Asp Gly Val Val Val Lys Leu Asp  
180

<210> 20

<211> 184

<212> PRT

<213> Thermus sp.

<220>

<221> UNSURE

<222> (18)..(120)

<223> Xaa at positions 18-120 is any amino acid

<220>

<221> UNSURE

<222> (126)..(172)

<223> Xaa at positions 126-172 is any amino acid

<400> 20

Tyr Thr Val Glu His Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr  
1 5 10 15

Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
50 55 60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
65 70 75 80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
85 90 95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
100 105 110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
115 120 125

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
130 135 140

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
145 150 155 160

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
165 170 175

Asp Gly Val Val Val Lys Leu Asp  
180

<210> 21



<211> 184

<212> PRT

<213> Thermus sp.

<220>

<221> UNSURE

<222> (18)..(120)

<223> Xaa at positions 18-120 is any amino acid

<220>

<221> UNSURE

<222> (126)..(172)

<223> Xaa at positions 126-172 is any amino acid

<400> 21

Tyr	Thr	Val	Glu	His	Lys	Val	Asp	Gly	Leu	Ser	Val	Asn	Leu	Tyr	Tyr
1				5					10					15	

Glu	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
			20					25						30	

Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
			35					40					45		

Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
			50					55					60		

Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
			65					70					75		80

Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
								85					90		95

Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
								100					105		110

Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Leu	Glu	Glu	Ser	Gly	Xaa	Xaa	Xaa
								115					120		125

Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
								130					135		140

Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
								145					150		155

Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Pro	Phe	Glu	Ala
								165					170		175

Asp Gly Val Val Val Lys Leu Asp  
180

<210> 22  
<211> 184  
<212> PRT  
<213> *Thermus aquaticus*

<220>  
<221> UNSURE  
<222> (18)..(120)  
<223> Xaa at positions 18-120 is any amino acid

<220>  
<221> UNSURE  
<222> (126)..(172)  
<223> Xaa at positions 126-172 is any amino acid

<400> 22  
Tyr Thr Val Glu Arg Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr  
1 5 10 15

Glu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
50 55 60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
65 70 75 80

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
85 90 95

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
100 105 110

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Leu Glu Glu Thr Gly Xaa Xaa Xaa  
115 120 125

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
130 135 140

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa



Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
130 135 140

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
145 150 155 160

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro  
165 170 175

Phe Glu Ala Asp Gly Val Val Val Lys Leu Asp  
180 185

<210> 24

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Peptide

<220>

<221> VARIANT

<222> (2)

<223> X at position 2 is any amino acid

<400> 24

Lys Xaa Asp Gly

1

<210> 25

<211> 527

<212> PRT

<213> Thermus aquaticus YT-1

<400> 25

Pro Glu Leu Lys Ser Pro Asp Ser Pro Thr Glu Gln Val Gly Ala Arg

1

5

10

15

Pro Leu Glu Ser Thr Phe Arg Pro Val Arg His Pro Thr Arg Met Tyr

20

25

30

Ser Leu Asp Asn Ala Phe Ser Leu Asp Glu Val Arg Ala Phe Glu Glu

35

40

45

Arg Ile Glu Arg Ala Leu Gly Arg Lys Gly Pro Phe Leu Tyr Thr Val

50	55	60
Glu His Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr Glu Glu Gly		
65	70	75 80
Ile Leu Val Phe Gly Ala Thr Arg Gly Asp Gly Glu Thr Gly Glu Glu		
	85	90 95
Val Thr Gln Asn Leu Leu Thr Ile Arg Thr Ile Pro Arg Arg Leu Thr		
	100	105 110
Gly Val Pro Asp Arg Leu Glu Val Arg Gly Glu Val Tyr Met Pro Ile		
	115	120 125
Glu Ala Phe Leu Arg Leu Asn Gln Glu Leu Glu Glu Ala Gly Glu Arg		
	130	135 140
Ile Phe Lys Asn Pro Arg Asn Ala Ala Ala Gly Ser Leu Arg Gln Lys		
145	150	155 160
Asp Pro Arg Val Thr Ala Arg Arg Gly Leu Arg Ala Thr Phe Tyr Ala		
	165	170 175
Leu Gly Leu Gly Leu Glu Glu Thr Gly Leu Lys Ser Gln His Asp Leu		
	180	185 190
Leu Leu Trp Leu Lys Glu Arg Gly Phe Pro Val Glu His Gly Phe Thr		
	195	200 205
Arg Ala Leu Gly Ala Glu Gly Val Glu Glu Val Tyr Gln Ala Trp Leu		
	210	215 220
Lys Glu Arg Arg Lys Leu Pro Phe Glu Ala Asp Gly Val Val Val Lys		
225	230	235 240
Leu Asp Asp Leu Ala Leu Trp Arg Glu Leu Gly Tyr Thr Ala Arg Ala		
	245	250 255
Pro Arg Phe Ala Leu Ala Tyr Lys Phe Pro Ala Glu Glu Lys Glu Thr		
	260	265 270
Arg Leu Leu Ser Val Ala Phe Gln Val Gly Arg Thr Gly Arg Ile Thr		
	275	280 285
Pro Val Gly Val Leu Glu Pro Val Phe Ile Glu Gly Ser Glu Val Ser		
	290	295 300
Arg Val Thr Leu His Asn Glu Ser Phe Ile Glu Glu Leu Asp Val Arg		

305		310		315		320
Ile Gly Asp Trp Val Leu Val His Lys Ala Gly Gly Val Ile Pro Glu						
	325		330		335	
Val Leu Arg Val Leu Lys Glu Arg Arg Thr Gly Glu Glu Lys Pro Ile						
	340		345		350	
Leu Trp Pro Glu Asn Cys Pro Glu Cys Gly His Ala Leu Leu Lys Glu						
	355		360		365	
Gly Lys Val His Arg Cys Pro Asn Pro Leu Cys Pro Ala Lys Arg Phe						
	370		375		380	
Glu Ala Ile Arg His Tyr Ala Ser Arg Lys Ala Met Asp Ile Gln Gly						
385		390		395		400
Leu Gly Glu Lys Leu Ile Glu Lys Leu Leu Glu Lys Gly Leu Val Arg						
	405		410		415	
Asp Val Ala Asp Leu Tyr Arg Leu Arg Lys Glu Asp Leu Leu Asp Leu						
	420		425		430	
Glu Arg Met Gly Glu Lys Ser Ala Glu Asn Leu Leu Arg Gln Ile Glu						
	435		440		445	
Glu Ser Lys Gly Arg Gly Leu Glu Arg Leu Leu Tyr Ala Leu Gly Leu						
	450		455		460	
Pro Gly Val Gly Glu Val Leu Ala Arg Asn Leu Ala Leu Arg Phe Gly						
465		470		475		480
His Met Asp Arg Leu Leu Glu Ala Gly Leu Gly Asp Leu Leu Glu Val						
	485		490		495	
Glu Gly Val Gly Glu Leu Thr Ala Arg Ala Ile Leu Asn Thr Leu Lys						
	500		505		510	
Asp Pro Glu Phe Arg Asp Leu Val Arg Arg Leu Lys Glu Ala Gly						
	515		520		525	

<210> 26

<211> 557

<212> PRT

<213> *Thermus aquaticus flavus*

<400> 26

Arg	Phe	Pro	Glu	Leu	Lys	Ser	Pro	Asp	Ser	Pro	Thr	Glu	Gln	Val	Gly	1	5	10	15
Ala	Arg	Pro	Leu	Glu	Ala	Thr	Phe	Arg	Pro	Val	Arg	His	Pro	Thr	Arg	20	25	30	
Met	Tyr	Ser	Leu	Asp	Asn	Ala	Phe	Asn	Phe	Asp	Glu	Leu	Lys	Ala	Phe	35	40	45	
Glu	Glu	Arg	Ile	Glu	Arg	Ala	Leu	Gly	Arg	Glu	Gly	Pro	Phe	Ala	Tyr	50	55	60	
Thr	Val	Glu	His	Lys	Val	Asp	Gly	Leu	Ser	Val	Asn	Leu	Tyr	Tyr	Glu	65	70	75	80
Asp	Gly	Val	Leu	Val	Tyr	Gly	Ala	Thr	Arg	Gly	Asp	Gly	Glu	Val	Gly	85	90	95	
Glu	Glu	Val	Thr	Gln	Asn	Leu	Leu	Thr	Ile	Pro	Thr	Ile	Pro	Arg	Arg	100	105	110	
Leu	Lys	Gly	Val	Pro	Glu	Arg	Leu	Glu	Val	Arg	Gly	Glu	Val	Tyr	Met	115	120	125	
Pro	Val	Glu	Ala	Phe	Leu	Arg	Leu	Asn	Glu	Glu	Leu	Glu	Glu	Arg	Gly	130	135	140	
Ala	Arg	Ile	Phe	Lys	Asn	Pro	Arg	Asn	Ala	Ala	Ala	Gly	Ser	Leu	Arg	145	150	155	160
Gln	Lys	Asp	Pro	Arg	Ile	Thr	Ala	Lys	Arg	Gly	Leu	Arg	Ala	Thr	Phe	165	170	175	
Tyr	Ala	Leu	Gly	Leu	Gly	Leu	Glu	Glu	Val	Glu	Arg	Glu	Gly	Val	Ala	180	185	190	
Thr	Gln	Phe	Ala	Leu	Leu	His	Trp	Leu	Lys	Glu	Lys	Ser	Phe	Pro	Val	195	200	205	
Glu	His	Gly	Tyr	Ala	Arg	Ala	Val	Gly	Ala	Glu	Gly	Val	Glu	Ala	Val	210	215	220	
Tyr	Gln	Asp	Trp	Leu	Lys	Lys	Arg	Arg	Ala	Leu	Pro	Phe	Glu	Ala	Asp	225	230	235	240
Gly	Val	Val	Val	Lys	Leu	Asp	Glu	Leu	Ala	Leu	Trp	Arg	Glu	Leu	Gly	245	250	255	

Tyr Thr Ala Arg Ala Pro Arg Phe Ala Ile Ala Tyr Lys Phe Pro Ala		
260	265	270
Glu Glu Lys Glu Thr Arg Leu Leu Asp Val Ala Phe Gln Val Gly Arg		
275	280	285
Thr Gly Arg Val Thr Pro Val Gly Ile Leu Glu Pro Val Phe Leu Glu		
290	295	300
Gly Ser Glu Val Ser Arg Val Thr Leu His Asn Glu Ser Tyr Ile Glu		
305	310	315 320
Glu Leu Asp Ile Arg Ile Gly Asp Trp Val Leu Val His Lys Ala Gly		
325	330	335
Gly Val Ile Pro Glu Val Leu Arg Val Leu Lys Glu Arg Arg Thr Gly		
340	345	350
Glu Glu Arg Pro Ile Arg Trp Pro Glu Thr Cys Pro Glu Cys Gly His		
355	360	365
Arg Leu Leu Lys Glu Gly Lys Val His Arg Cys Pro Asn Pro Leu Cys		
370	375	380
Pro Ala Lys Arg Phe Glu Ala Ile Arg His Phe Pro Ser Arg Lys Ala		
385	390	395 400
Met Asp Ile Gln Gly Leu Gly Glu Lys Leu Ile Glu Arg Leu Leu Glu		
405	410	415
Lys Gly Leu Val Lys Asp Val Ala Asp Leu Tyr Arg Leu Arg Lys Glu		
420	425	430
Asp Leu Val Gly Leu Glu Arg Met Gly Glu Lys Ser Ala Gln Asn Leu		
435	440	445
Leu Arg Gln Ile Glu Glu Ser Lys Arg Arg Gly Leu Glu Arg Leu Leu		
450	455	460
Tyr Ala Leu Gly Leu Pro Gly Val Gly Glu Val Leu Ala Arg Asn Leu		
465	470	475 480
Ala Ala Arg Phe Gly Asn Met Asp Arg Leu Leu Glu Ala Ser Leu Glu		
485	490	495
Glu Leu Leu Glu Val Glu Glu Val Gly Glu Leu Thr Ala Arg Ala Ile		
500	505	510



Leu Glu Thr Leu Lys Asp Pro Ala Phe Arg Asp Leu Val Arg Arg Leu  
515 520 525

Lys Glu Ala Gly Val Glu Met Glu Ala Lys Glu Lys Gly Gly Glu Ala  
530 535 540

Leu Lys Gly Leu Thr Phe Val Ile Thr Gly Glu Leu Ser  
545 550 555

<210> 27

<211> 546

<212> PRT

<213> Thermus filiformis Tok4A2

<400> 27

Asp Ser Pro Thr Glu Gln Val Gly Ala Arg Pro Leu Glu Pro Thr Phe  
1 5 10 15

Arg Pro Val Arg His Pro Thr Arg Met Tyr Ser Leu Asp Asn Ala Phe  
20 25 30

Thr Tyr Glu Glu Val Leu Ala Phe Glu Glu Arg Leu Asp Arg Ala Leu  
35 40 45

Gly Arg Lys Arg Pro Phe Leu Tyr Thr Val Glu His Lys Val Asp Gly  
50 55 60

Leu Ser Val Asn Leu Tyr Tyr Glu Glu Gly Val Leu Val Phe Gly Ala  
65 70 75 80

Thr Arg Gly Asp Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
85 90 95

Thr Ile Pro Thr Ile Pro Arg Arg Leu Lys Gly Val Pro Asp Arg Leu  
100 105 110

Glu Val Arg Gly Glu Val Tyr Met Pro Ile Glu Ala Phe Leu Arg Leu  
115 120 125

Asn Glu Glu Leu Glu Glu Arg Gly Glu Lys Val Phe Lys Asn Pro Arg  
130 135 140

Asn Ala Ala Ala Gly Ser Leu Arg Gln Lys Asp Pro Arg Val Thr Ala  
145 150 155 160

Lys Arg Gly Leu Arg Ala Thr Phe Tyr Ala Leu Gly Leu Gly Leu Glu  
165 170 175

Glu Ser Gly Leu Lys Ser Gln Tyr Glu Leu Leu Leu Trp Leu Lys Glu		
180	185	190
Lys Gly Phe Pro Val Glu His Gly Tyr Glu Lys Ala Leu Gly Ala Glu		
195	200	205
Gly Val Glu Glu Val Tyr Gln Ala Xaa Xaa Xaa Lys Arg His Ala Leu		
210	215	220
Pro Phe Glu Ala Asp Gly Val Val Val Lys Met Asp Asp Leu Thr Leu		
225	230	235 240
Trp Gly Glu Leu Gly Tyr Thr Ala Arg Ala Pro Arg Phe Ala Ile Ala		
245	250	255
Tyr Lys Phe Pro Ala Glu Glu Asn Glu Thr Arg Leu Leu Asp Val Asp		
260	265	270
Phe Gln Val Gly Arg Thr Gly Arg Val Thr Pro Val Gly Ile Leu Glu		
275	280	285
Pro Val Phe Leu Glu Gly Ser Glu Val Ser Arg Val Thr Leu His Asn		
290	295	300
Glu Ser Tyr Ile Glu Glu Leu Asp Ile Arg Ile Gly Asp Trp Val Leu		
305	310	315 320
Val His Lys Ala Gly Gly Val Ile Pro Glu Val Leu Arg Val Leu Lys		
325	330	335
Glu Arg Arg Thr Gly Glu Glu Arg Pro Ile Arg Trp Pro Glu Thr Cys		
340	345	350
Pro Glu Cys Gly His Arg Leu Leu Lys Glu Gly Lys Val His Arg Cys		
355	360	365
Pro Asn Pro Leu Cys Pro Ala Lys Arg Phe Glu Ala Ile Arg His Phe		
370	375	380
Pro Ser Arg Lys Ala Met Asp Ile Gln Gly Leu Gly Glu Lys Leu Ile		
385	390	395 400
Glu Arg Leu Leu Glu Lys Gly Leu Val Lys Asp Val Ala Asp Leu Tyr		
405	410	415
Arg Leu Arg Lys Glu Asp Leu Val Gly Leu Glu Arg Met Gly Glu Lys		
420	425	430

Ser Ala Gln Asn Leu Leu Arg Gln Ile Glu Glu Ser Lys Arg Arg Gly  
 435 440 445

Leu Glu Arg Leu Leu Tyr Ala Leu Gly Leu Pro Gly Val Gly Glu Val  
 450 455 460

Leu Ala Arg Asn Leu Ala Ala Arg Phe Gly Asn Met Asp Arg Leu Leu  
 465 470 475 480

Glu Ala Ser Leu Glu Glu Leu Leu Glu Val Glu Glu Val Gly Glu Leu  
 485 490 495

Thr Ala Arg Ala Ile Leu Glu Thr Leu Lys Asp Pro Ala Phe Arg Asp  
 500 505 510

Leu Val Arg Arg Leu Lys Glu Ala Gly Val Glu Met Glu Ala Lys Glu  
 515 520 525

Lys Gly Gly Glu Ala Leu Lys Gly Leu Thr Phe Val Ile Thr Gly Glu  
 530 535 540

Leu Ser  
 545

<210> 28

<211> 537

<212> PRT

<213> Thermus filiformis Tok6A1

<400> 28

Arg Phe Pro Glu Phe Lys Ser Pro Asp Ser Pro Thr Glu Gln Val Gly  
 1 5 10 15

Ala Arg Pro Leu Glu Pro Thr Phe Arg Pro Val Arg His Pro Thr Arg  
 20 25 30

Met Tyr Ser Leu Asp Asn Ala Phe Thr Tyr Glu Glu Val Leu Ala Phe  
 35 40 45

Glu Glu Arg Leu Glu Arg Ala Leu Gly Arg Lys Arg Pro Phe Leu Tyr  
 50 55 60

Thr Val Glu His Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr Glu  
 65 70 75 80

Glu Gly Val Leu Val Phe Gly Ala Thr Arg Gly Asp Gly Glu Val Gly

85										90					95									
Glu	Glu	Val	Thr	Gln	Asn	Leu	Leu	Thr	Ile	Pro	Thr	Ile	Pro	Arg	Arg									
100										105					110									
Leu	Lys	Gly	Val	Pro	Asp	Arg	Leu	Glu	Val	Arg	Gly	Glu	Val	Tyr	Met									
115										120					125									
Pro	Ile	Glu	Ala	Phe	Leu	Arg	Leu	Asn	Glu	Glu	Leu	Glu	Glu	Arg	Gly									
130										135					140									
Glu	Lys	Val	Phe	Lys	Asn	Pro	Arg	Asn	Ala	Ala	Ala	Gly	Ser	Leu	Arg									
145										150					155					160				
Gln	Lys	Asp	Pro	Arg	Val	Thr	Ala	Lys	Arg	Gly	Leu	Arg	Ala	Thr	Phe									
165										170					175									
Tyr	Ala	Leu	Gly	Leu	Gly	Leu	Glu	Glu	Ser	Gly	Leu	Lys	Ser	Gln	Tyr									
180										185					190									
Glu	Leu	Leu	Leu	Trp	Leu	Lys	Glu	Lys	Gly	Phe	Pro	Val	Glu	His	Gly									
195										200					205									
Tyr	Glu	Lys	Ala	Leu	Gly	Ala	Glu	Gly	Val	Glu	Glu	Val	Tyr	Arg	Arg									
210										215					220									
Phe	Leu	Ala	Gln	Arg	His	Ala	Leu	Pro	Phe	Glu	Ala	Asp	Gly	Val	Val									
225										230					235					240				
Val	Lys	Leu	Asp	Asp	Leu	Ala	Leu	Trp	Arg	Glu	Leu	Gly	Tyr	Thr	Ala									
245										250					255									
Arg	Ala	Pro	Arg	Phe	Ala	Leu	Ala	Tyr	Lys	Phe	Pro	Ala	Glu	Glu	Lys									
260										265					270									
Glu	Thr	Arg	Leu	Leu	Asp	Val	Val	Phe	Gln	Val	Gly	Arg	Thr	Gly	Arg									
275										280					285									
Val	Thr	Pro	Val	Gly	Val	Leu	Glu	Pro	Val	Phe	Ile	Glu	Gly	Ser	Glu									
290										295					300									
Val	Ser	Arg	Val	Thr	Leu	His	Asn	Glu	Ser	Tyr	Ile	Glu	Glu	Leu	Asp									
305										310					315					320				
Ile	Arg	Ile	Gly	Asp	Trp	Val	Leu	Val	His	Lys	Ala	Gly	Gly	Val	Ile									
325										330					335									
Pro	Glu	Val	Leu	Arg	Val	Leu	Lys	Glu	Arg	Arg	Thr	Gly	Glu	Glu	Arg									

340	345	350
Pro Ile Arg Trp Pro Glu Thr Cys Pro Glu Cys Gly His Arg Leu Val		
355	360	365
Lys Glu Gly Lys Val His Arg Cys Pro Asn Pro Leu Cys Pro Ala Lys		
370	375	380
Arg Phe Glu Ala Ile Arg His Tyr Ala Ser Arg Lys Ala Met Asp Ile		
385	390	395 400
Glu Gly Leu Gly Glu Lys Leu Ile Glu Arg Leu Leu Glu Lys Gly Leu		
405	410	415
Val Arg Asp Val Ala Asp Leu Tyr His Leu Arg Lys Glu Asp Leu Leu		
420	425	430
Gly Leu Glu Arg Met Gly Glu Lys Ser Ala Gln Asn Leu Leu Arg Gln		
435	440	445
Ile Glu Glu Ser Lys His Arg Gly Leu Glu Arg Leu Leu Tyr Ala Leu		
450	455	460
Gly Leu Pro Gly Val Gly Glu Val Leu Ala Arg Asn Leu Ala Arg Arg		
465	470	475 480
Phe Gly Thr Met Asp Arg Leu Leu Glu Ala Ser Leu Glu Glu Leu Leu		
485	490	495
Glu Val Glu Glu Val Gly Glu Leu Thr Ala Arg Ala Ile Leu Glu Thr		
500	505	510
Leu Lys Asp Pro Ala Phe Arg Asp Leu Val Arg Arg Leu Lys Glu Ala		
515	520	525
Gly Val Ser Met Glu Ser Lys Glu Glu		
530	535	

<210> 29

<211> 505

<212> PRT

<213> Thermus sp. Vil3

<400> 29

Pro Ser Pro Asp Ser Pro Thr Glu Gln Val Gly Ala Lys Pro Leu Glu
1 5 10 15

Ala	Thr	Phe	Arg	Pro	Ile	Arg	His	Pro	Thr	Arg	Met	Tyr	Ser	Leu	Asp			
			20					25					30					
Asn	Ala	Phe	Thr	Leu	Glu	Glu	Val	Arg	Thr	Phe	Glu	Glu	Arg	Ile	Glu			
		35					40					45						
Arg	Ala	Leu	Gly	Arg	Lys	Gly	Pro	Phe	Val	Tyr	Thr	Val	Glu	His	Lys			
		50				55						60						
Val	Asp	Gly	Leu	Ser	Val	Asn	Leu	Tyr	Tyr	Glu	Glu	Gly	Ile	Leu	Val			
	65				70					75					80			
Trp	Gly	Ala	Thr	Arg	Gly	Asp	Gly	Glu	Thr	Gly	Glu	Glu	Val	Thr	Gln			
				85					90					95				
Asn	Leu	Leu	Thr	Ile	Pro	Thr	Ile	Pro	Arg	Arg	Leu	Lys	Gly	Val	Pro			
			100					105					110					
Glu	Arg	Leu	Glu	Val	Arg	Gly	Glu	Val	Tyr	Met	Pro	Ile	Glu	Ala	Phe			
		115					120						125					
Leu	Arg	Leu	Asn	Glu	Glu	Leu	Glu	Glu	Lys	Gly	Glu	Lys	Ile	Phe	Lys			
		130				135					140							
Asn	Pro	Arg	Asn	Ala	Ala	Ala	Gly	Ser	Phe	Arg	Gln	Lys	Asp	Pro	Arg			
	145				150					155					160			
Ile	Thr	Ala	Arg	Arg	Gly	Leu	Arg	Ala	Thr	Phe	Tyr	Ala	Leu	Gly	Leu			
				165					170					175				
Gly	Leu	Glu	Glu	Ser	Gly	Leu	Lys	Thr	Gln	Leu	Asp	Leu	Leu	His	Trp			
			180					185					190					
Leu	Arg	Glu	Lys	Gly	Phe	Pro	Val	Glu	His	Gly	Phe	Ala	Arg	Ala	Glu			
		195					200					205						
Gly	Ala	Glu	Gly	Val	Glu	Arg	Ile	Tyr	Gln	Gly	Trp	Leu	Lys	Glu	Arg			
		210				215					220							
Arg	Ser	Leu	Pro	Phe	Glu	Ala	Asp	Gly	Val	Val	Val	Lys	Leu	Asp	Glu			
	225				230					235				240				
Leu	Ser	Leu	Trp	Arg	Glu	Leu	Gly	Tyr	Thr	Ala	Arg	Ala	Pro	Arg	Phe			
				245					250					255				
Ala	Ile	Ala	Tyr	Lys	Phe	Pro	Ala	Glu	Glu	Lys	Glu	Thr	Ala	Leu	Phe			
			260				265						270					

Gln Val Val Leu Gln Val Gly Arg Thr Gly Gln Val Thr Pro Val Gly  
 275 280 285

Ile Leu Glu Pro Val Phe Ile Glu Gly Ser Glu Val Ser Arg Val Thr  
 290 295 300

Leu His Asn Glu Ser Tyr Ile Glu Asp Leu Asp Val Arg Ile Gly Glu  
 305 310 315 320

Trp Val Leu Val His Asn Ala Gly Gly Val Ile Pro Glu Val Leu Arg  
 325 330 335

Val Leu Lys Glu Lys Arg Thr Gly Glu Glu Arg Pro Ile Arg Trp Pro  
 340 345 350

Glu Thr Cys Pro Glu Cys Gly His Arg Leu Val Lys Glu Gly Lys Val  
 355 360 365

His Arg Cys Pro Asn Pro Leu Cys Pro Ala Lys Arg Phe Glu Ala Ile  
 370 375 380

Arg His Tyr Ala Ser Arg Lys Ala Met Asp Ile Gly Gly Leu Gly Glu  
 385 390 395 400

Lys Leu Ile Glu Lys Leu Leu Glu Lys Gly Leu Val Lys Asp Val Ala  
 405 410 415

Asp Leu Tyr Arg Leu Lys Glu Glu Asp Leu Val Gly Leu Glu Arg Met  
 420 425 430

Gly Lys Lys Ser Ala Gln Asn Leu Leu Arg Gln Ile Glu Lys Ser Lys  
 435 440 445

Ala Arg Gly Leu Glu Arg Leu Leu Tyr Ala Leu Gly Leu Pro Gly Val  
 450 455 460

Gly Glu Val Leu Ala Arg Asn Leu Ala Ala His Phe Gly Thr Met Asp  
 465 470 475 480

Arg Leu Leu Glu Ala Ser Leu Glu Glu Leu Leu Gln Val Glu Glu Val  
 485 490 495

Gly Glu Leu Thr Ala Arg Gly Ile Tyr  
 500 505

<210> 30  
 <211> 481

<212> PRT

<213> Thermus sp. SM32

<400> 30

Asp Asn Ala Phe Thr His His Asp Leu Lys Ala Phe Glu Asp Arg Val  
1 5 10 15

Asp Arg Ala Leu Gly Arg Glu Gly Pro Phe Val Tyr Thr Val Glu His  
20 25 30

Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr Glu Glu Gly Ile Leu  
35 40 45

Val Phe Gly Ala Pro Arg Gly Asp Gly Glu Val Gly Glu Glu Val Thr  
50 55 60

Gln Asn Leu Leu Thr Ile Pro Thr Ile Pro Arg Arg Leu Lys Gly Val  
65 70 75 80

Pro Glu Arg Leu Glu Val Arg Gly Glu Val Tyr Met Pro Ile Glu Ala  
85 90 95

Phe Leu Arg Leu Asn Glu Glu Leu Glu Glu Ala Gly Glu Lys Val Phe  
100 105 110

Lys Asn Pro Arg Asn Ala Ala Ala Gly Ser Leu Arg Gln Lys Asp Pro  
115 120 125

Arg Ile Thr Ala Lys Arg Gly Leu Arg Ala Thr Phe Tyr Ala Leu Gly  
130 135 140

Leu Gly Leu Glu Glu Ser Gly Leu Lys Thr Gln Tyr Glu Phe Leu Leu  
145 150 155 160

Trp Phe Lys Glu Lys Gly Phe Pro Val Glu His Gly Phe Ala Arg Ala  
165 170 175

Thr Gly Ala Glu Gly Val Glu Arg Val Tyr Gln Gly Trp Leu Gln Lys  
180 185 190

Arg Arg Lys Leu Pro Phe Glu Ala Asp Gly Val Val Val Lys Leu Asp  
195 200 205

Glu Leu Ala Leu Trp Arg Glu Leu Gly Tyr Thr Ala Arg Ala Pro Arg  
210 215 220

Phe Ala Ile Ala Tyr Lys Phe Pro Ala Glu Glu Lys Glu Thr Arg Leu  
225 230 235 240



Leu Asp Val Val Phe Gln Val Gly Arg Thr Gly Arg Val Thr Pro Val  
 245 250 255  
 Gly Ile Leu Glu Pro Val Leu Ile Glu Gly Ser Glu Val Ser Arg Val  
 260 265 270  
 Thr Leu His Asn Glu Ser Tyr Ile Glu Glu Leu Asp Ile Arg Ile Gly  
 275 280 285  
 Asp Trp Val Leu Val His Lys Ala Gly Gly Val Ile Pro Glu Val Leu  
 290 295 300  
 Arg Val Leu Lys Glu Arg Arg Thr Gly Ala Glu Arg Pro Ile Val Trp  
 305 310 315 320  
 Pro Glu Asn Cys Pro Glu Cys Gly His His Leu Val Lys Glu Gly Lys  
 325 330 335  
 Val His Arg Cys Pro Asn Pro Leu Cys Pro Ala Lys Arg Phe Glu Ala  
 340 345 350  
 Ile Arg His Tyr Ala Ser Arg Lys Ala Met Asp Ile Gln Gly Leu Gly  
 355 360 365  
 Glu Lys Leu Ile Glu Lys Leu Leu Glu Asn Gly Leu Val Lys Asp Val  
 370 375 380  
 Ala Asp Leu Tyr Arg Leu Arg Lys Glu Asp Leu Val Gly Leu Glu Arg  
 385 390 395 400  
 Met Gly Glu Lys Ser Ala Glu Asn Leu Leu Arg Gln Ile Glu Glu Ser  
 405 410 415  
 Lys His Arg Gly Leu Glu Arg Leu Leu Tyr Ala Leu Gly Leu Pro Gly  
 420 425 430  
 Val Gly Glu Val Leu Ala Arg Asn Leu Ala Ala Arg Phe Gly Thr Met  
 435 440 445  
 Asp Arg Leu Leu Glu Ala Thr Leu Glu Glu Leu Leu Glu Val Glu Glu  
 450 455 460  
 Val Gly Glu Leu Thr Ala Arg Gly Ile Trp Glu Thr Leu Gln Asp Pro  
 465 470 475 480  
 Ala

<210> 31

<211> 674

<212> PRT

<213> *Thermus scotoductus*

<400> 31

Met Thr Leu Glu Glu Ala Arg Lys Arg Val Asn Glu Leu Arg Asp Leu  
1 5 10 15

Ile Arg Tyr His Asn Tyr Arg Tyr Tyr Val Leu Ala Asp Pro Glu Ile  
20 25 30

Ser Asp Ala Glu Tyr Asp Arg Leu Leu Arg Glu Leu Lys Glu Leu Glu  
35 40 45

Glu Arg Phe Pro Glu Leu Lys Ser Pro Asp Ser Pro Thr Glu Gln Val  
50 55 60

Gly Ala Lys Pro Leu Glu Ala Thr Phe Arg Pro Ile Arg His Pro Thr  
65 70 75 80

Arg Met Tyr Ser Leu Asp Asn Ala Phe Asn Phe Asp Glu Leu Lys Ala  
85 90 95

Phe Glu Glu Arg Ile Gly Arg Ala Leu Gly Arg Glu Gly Pro Phe Ala  
100 105 110

Tyr Thr Val Glu His Lys Val Asp Gly Leu Ser Val Asn Leu Tyr Tyr  
115 120 125

Glu Asp Gly Val Leu Val Trp Gly Ala Thr Arg Gly Asp Gly Glu Val  
130 135 140

Gly Glu Glu Val Thr Gln Asn Leu Leu Thr Ile Pro Thr Ile Pro Arg  
145 150 155 160

Arg Val Lys Gly Val Pro Glu Arg Leu Glu Val Arg Gly Glu Val Tyr  
165 170 175

Met Pro Ile Glu Ala Phe Leu Arg Leu Asn Glu Glu Leu Glu Glu Lys  
180 185 190

Gly Glu Lys Ile Phe Lys Asn Pro Arg Asn Ala Ala Ala Gly Ser Leu  
195 200 205

Arg Gln Lys Asp Pro Arg Ile Thr Ala Arg Arg Gly Leu Arg Ala Thr

210	215	220
Phe Tyr Ala Leu Gly Leu Gly Leu Glu Glu Ser Gly Leu Lys Thr Gln		
225	230	235 240
Leu Asp Leu Leu His Trp Leu Arg Glu Lys Gly Phe Pro Val Glu His		
	245	250 255
Gly Phe Ala Arg Ala Glu Gly Ala Glu Gly Val Glu Arg Ile Tyr Gln		
	260	265 270
Gly Trp Leu Lys Glu Arg Arg Ser Leu Pro Phe Glu Ala Asp Gly Val		
	275	280 285
Val Val Lys Leu Asp Glu Leu Ser Leu Trp Arg Glu Leu Gly Tyr Thr		
	290	295 300
Ala Arg Ala Pro Arg Phe Ala Ile Ala Tyr Lys Phe Pro Ala Glu Glu		
305	310	315 320
Lys Glu Thr Arg Leu Leu Gln Val Val Phe Gln Val Gly Arg Thr Gly		
	325	330 335
Arg Val Thr Pro Val Gly Ile Leu Glu Pro Val Phe Ile Glu Gly Ser		
	340	345 350
Val Val Ser Arg Val Thr Leu His Asn Glu Ser Tyr Ile Glu Glu Leu		
	355	360 365
Asp Val Arg Ile Gly Asp Trp Val Leu Val His Lys Ala Gly Gly Val		
	370	375 380
Ile Pro Glu Val Leu Arg Val Leu Lys Glu Lys Arg Thr Gly Glu Glu		
385	390	395 400
Arg Pro Ile Arg Trp Pro Glu Thr Cys Pro Glu Cys Gly His Arg Leu		
	405	410 415
Val Lys Glu Gly Lys Val His Arg Cys Pro Asn Pro Leu Cys Pro Ala		
	420	425 430
Lys Arg Phe Glu Ala Ile Arg His Tyr Ala Ser Arg Lys Ala Met Asp		
	435	440 445
Ile Gly Gly Leu Gly Glu Lys Leu Ile Glu Lys Leu Leu Glu Lys Gly		
	450	455 460
Leu Val Lys Asp Val Ala Asp Leu Tyr Arg Leu Lys Lys Glu Asp Leu		

465		470		475		480
Leu Gly Leu Glu Arg Met Gly Glu Lys Ser Ala Gln Asn Leu Leu Arg						
	485		490		495	
Gln Ile Glu Glu Ser Lys Gly Arg Gly Leu Glu Arg Leu Leu Tyr Ala						
	500		505		510	
Leu Gly Leu Pro Gly Val Gly Glu Val Leu Ala Arg Asn Leu Ala Ala						
	515		520		525	
His Phe Gly Thr Met Asp Arg Leu Leu Glu Ala Ser Leu Glu Glu Leu						
	530		535		540	
Leu Gln Val Glu Glu Val Gly Glu Leu Thr Ala Arg Gly Ile Tyr Glu						
545		550		555		560
Thr Leu Gln Asp Pro Ala Phe Arg Asp Leu Val Arg Arg Leu Lys Glu						
	565		570		575	
Ala Gly Val Val Met Glu Ala Lys Glu Arg Gly Glu Glu Ala Leu Lys						
	580		585		590	
Gly Leu Thr Phe Val Ile Thr Gly Glu Leu Ser Arg Pro Arg Glu Glu						
	595		600		605	
Val Lys Ala Leu Leu Arg Arg Leu Gly Ala Lys Val Thr Asp Ser Val						
	610		615		620	
Ser Arg Lys Thr Ser Tyr Leu Val Val Gly Glu Asn Pro Gly Ser Lys						
625		630		635		640
Leu Glu Lys Ala Arg Ala Leu Gly Val Pro Thr Leu Thr Glu Glu Glu						
	645		650		655	
Leu Tyr Arg Leu Ile Glu Glu Arg Thr Gly Lys Pro Val Glu Thr Leu						
	660		665		670	
Ala Ser						